

young *privat-docent*, working alone in his single room night after night for two years without an interruption until, in 1859, he published his accumulated results in a bulky volume, "*Untersuchungen ueber der Physiologie des Elektrotonus*," Berlin, 1859?

By the side of this picture of the active young searcher in the 'fifties of last century might be placed a picture of the no less active learner of the 'nineties who, at the age of seventy, with forty years of service behind him as professor of physiology in the University of Bonn, and with no worldly reward in front of him of money or position or of fame, day by day and month by month carried out with his own hand the mechanical *minutiae* of daily quantitative estimation of nitrogen necessary to satisfy his mind as to the balance sheet of nitrogen of a dog under physiological conditions strictly supervised by himself, and, as is shown by the 131 volumes of Pflüger's *Archiv*, of which the first volume appeared in 1868 and the 131st in 1910. His faithful service to physiology continued for ten years longer, to the fifty-first year of his ordinary professorship, to the eighty-first year of his life.

Eduard Friedrich Wilhelm Pflüger, born in 1829, a pupil of Johannes Muller, is the last of the great German school of physiological and biological workers—Hæckel, Lieberkühn, Du Bois Reymond, Henle, Ludwig, Brücke, Helmholtz, Pflüger.

Pflüger lived a retired life, devoted to his work in the laboratory and in the library, which he hardly ever left, and in which he did not welcome the interruption of the visitor; *no one admitted except on business* might well have been the inscription upon his door, and he was never seen at physiological congresses. I count among one of the pleasantest recollections of my life a day spent in Pflüger's laboratory with Pflüger himself and Heinrich Herz, whose simple demonstration of Maxwell's forecast had been made in the previous year, and whom death so soon cut short. We spent the day watching the movements of Lippmann's capillary electrometer, and the time passed unnoticed; there was no inhumanity in connection with the author of Pflüger's law when the accuracy of a physiological assertion of fact was to be scrutinised.

To the scientific world Pflüger's permanent monument consists in the 131 volumes of Pflüger's *Archiv*. Many workmen have contributed to that monument, and, among the mass of contributions, the work of Pflüger himself stands good as well and truly laid. The mechanism of spinal action in the frog, and his law of reflex action as studied upon the decapitated animal, were his earliest subjects of study, and are to-day still classical. We cannot discuss the mechanism of nervous coordination without at once appealing to the experiments of Pflüger and the decapitated frog more than fifty years ago, in preface to our discussion of the experiments of Sherrington on the spinal mammal which belongs to the last decade.

The tenth volume of Pflüger's *Archiv* (1875), containing his paper, "*Ueber die Physiologische Verbrennung in den lebendigen Organismen*," has played an important part in our knowledge and notions as to the chemical respiration of the tissues.

Pflüger's bloodless and salted frog continuing to discharge  $\text{CO}_2$  in an atmosphere of nitrogen or in vacuo is clear evidence that  $\text{CO}_2$  is not due to the immediate action of oxygen, but that it is formed from the dissociation of some storage compound, or, as Pflüger expressed it, previously absorbed oxygen has helped to wind up the physiological clock, the  $\text{CO}_2$  discharged at the moment is a sign that the clock is running down. In discussing the latest contribution to our knowledge of this subject, those, for instance, brought out by Leonard Hill as regards the

beneficial effect of oxygen upon muscular work, we are obliged to refer to Pflüger's teaching.

Nutrition, its debtor and creditor account in the body in terms of nitrogen and of carbon; glycogen, its relation to carbohydrate antecedent and its questionable relation to protein antecedents; fat, its absorption, relation to carbohydrate, the problem of diabetes and the origin of diabetic sugar, formed the principal field of Pflüger's unceasing labours during the last twenty-five years of his life.

Pflüger died on March 17, aged eighty-one, at the end of over sixty years of single-minded and unswerving devotion as a student of physiology, fifty years of which were spent as ordinary professor of physiology in the University of Bonn.

A. D. WALLER.

#### NOTES.

IN consequence of the lamented death of the King, and out of respect to his memory, many scientific meetings and other functions have been postponed or cancelled. The *soirée* of the Royal Society, announced for May 25, will not take place. The meetings of the society will not be resumed until May 26. The president of the Royal Institution has decided that the lectures and evening meetings be discontinued until further notice. The anniversary dinner of the Royal Geographical Society, which was arranged for May 23, will not be held; the anniversary meeting will be held as arranged, at 3 p.m. The meeting of the Royal Meteorological Society which had been fixed for Wednesday, May 18, has been postponed to Wednesday, May 25.

WE notice with regret the announcement of the death of Prof. S. Cannizzaro, Foreign Member of the Royal Society and professor of chemistry in the University of Rome, at eighty-three years of age.

At the meeting of the Royal Society on May 5 the following candidates for fellowship were elected into the society:—Mr. J. Barcroft, Prof. G. C. Bourne, Prof. A. P. Coleman, Dr. F. A. Dixey, Dr. L. N. G. Filon, Mr. A. Fowler, Dr. A. E. Garrod, Mr. G. H. Hardy, Dr. J. A. Harker, Prof. J. T. Hewitt, Prof. B. Hopkinson, Dr. A. Lapworth, Lieut.-Colonel Sir W. B. Leishman, Mr. H. G. Plimmer, and Mr. F. Soddy.

Now that our returning summer migrants are being eagerly looked out for, and the arrival of many of them has been recorded during the last few weeks, the question arises in the minds of many people, "Do the same individual birds which nested last year come back to nest in the same place?" This is a question, of course, which might be equally well asked of our "resident" birds, but in the case of migrants, such as the swallow, which we know for certain does not winter anywhere north of Africa, actual proof that the same individual returns after its long journey to and fro, and its sojourn in its far off winter quarters, to the very same spot in which it nested the year before is sensational. Such proof in the case of one swallow, in any case, is just to hand. Dr. C. B. Ticehurst records the following in the last number of *British Birds*:—"On April 12, 1910, the first swallow (*Hirundo rustica*) was seen at 4 p.m. passing the house at Huntbourne, High Halden, Kent, which lies in the line of a small migration-route; at 6 p.m. a small flight of swallows passed over to the north, and from it four birds separated, and after flying round the house and settling on the chimney-pots, finally went to roost in a shed where two pairs bred last year. Two days afterwards I caught a

swallow at roost in this shed, almost certainly one of those that arrived on April 12, and found it was one which my sister had caught and ringed as an adult bird on May 8, 1909, the bird having come down one of the chimneys into one of the rooms. I may note that there was no mark or injury of any kind on the leg which bore the ring." The system of marking birds by aluminium rings will no doubt teach us much that we cannot learn by any other means. Last year more than 2000 birds were "ringed" by readers of Mr. H. F. Witherby's magazine *British Birds*, and this year at least double that number will be "ringed." Each ring bears a separate number as well as the inscription "Witherby, High Holborn, London," and careful details are kept of the date and place at which each bird was marked. Should any of these ringed birds fall into the hands of any readers of NATURE, Mr. Witherby would be glad to be informed of the date and place of the capture and the number on the ring.

PROF. WALTER NERNST, director of the Physical Chemistry Institute in the University of Berlin, has been elected an honorary member of the Manchester Literary and Philosophical Society.

AN International Conference will meet in Paris on May 18 to consider the questions raised by the development of aerial navigation, with the object of arriving at an international agreement with respect to them. Most of the European Powers will be represented. Delegates to represent the United Kingdom have been nominated by the Admiralty, the Army Council, the Board of Trade, and the Secretary of State for the Home Department.

THE prize of 20*l.* recently offered by the Scottish Meteorological Society for the best essay on a meteorological subject has been awarded by the council of the society to Mr. David MacOwan, of Edinburgh University, for an essay on "Atmospheric Electricity." The competition, it may be recalled, was open to students of the Scottish universities and to graduates of not more than five years' standing.

DR. AND MRS. SELIGMANN have returned from their first exploratory ethnological survey of the Anglo-Egyptian Sudan, to which they were appointed by the Anglo-Egyptian Government. They studied the hitherto uninvestigated Nubas of southern Kordofan, and the Shilluks, Dinkas, and Shir of the White Nile. A short time was spent between the White and Blue Niles, where a Neolithic site was discovered. Observations were made on the sociology and religion of various tribes, and some anthropometrical data were obtained, especially of the Nubas.

At the meeting of the American Philosophical Society on April 23, the following foreign members were elected:—Prof. A. von Meyer, Madame Curie, Sir David Gill, K.C.B., Prof. E. Meyer, and Prof. C. E. Picard. We learn from *Science* that members of the U.S. National Academy of Sciences have been elected as follows:—Prof. F. R. Moulton, Prof. W. A. Noyes, Mr. T. B. Osborne, Prof. C. Schuchert, Prof. D. H. Campbell, Prof. J. Loeb, and Prof. J. Dewey. Dr. G. E. Hale has been elected foreign secretary of the academy, to succeed the late Prof. Alexander Agassiz. The Draper medal has been conferred on Dr. C. G. Abbot, director of the Astrophysical Observatory of the Smithsonian Institution.

THE Royal College of Physicians announces that the next award of the Weber-Parkes prize of 150 guineas and a silver medal will be made in 1912, and that the adjudicators have selected as the subject of the essay "The Influence of Mixed and Secondary Infections upon Pul-

monary Tuberculosis in Man, and the Measures, Preventive and Curative, for dealing with Them." The Croonian lectures of the college will be delivered in June next by Dr. F. W. Andrewes, the Harveian oration in October by Dr. H. B. Donkin, the Bradshaw lecture by Dr. G. N. Pitt, the FitzPatrick lectures by Sir T. Clifford Allbutt, and the Horace Dobell lecture by Dr. W. Bulloch.

THE annual autumn meeting of the Institute of Metals will be held in Glasgow on September 21–22, on which days papers of scientific and practical interest will be read and visits made to works of metallurgical interest. An influential local committee, of which Prof. A. Barr is chairman and Dr. Cecil H. Desch is honorary secretary, has already been formed to carry out the necessary arrangements, of which further notice will be given in due course. There has been established at the offices of the institute a pathological museum for specimens of metals and alloys, the first contributions to the museum having been received from the president, Sir Gerard A. Muntz, Bart. This museum, which is the only one of its kind, ought to be of great service to all interested in the metallurgy of the non-ferrous metals, as it is intended that it shall contain specimens showing the various ways in which such metals as copper, brass, aluminium, &c., can fail either as a result of faulty manufacture or of improper usage.

A REUTER message of May 5 from San Juan del Sur, Nicaragua, stated that Cartago, Costa Rica, was practically destroyed by an earthquake at 6.30 p.m. on May 4. Five Central American Republics reported earthquake shocks. The *Times* Washington correspondent says that though Costa Rica is supposed to be the southern limit of the earthquake zone, the discussion has again commenced as to whether a sea-level canal would not have been more stable than the lock type for the Panama Canal now under construction. According to Reuter, two hours after the shock a brilliant meteor passed over the Costa Rica-Nicaraguan frontier, leaving a luminous track behind it, and augmenting the fears of the populace. As in many other cases, this earthquake occurred as the moon was approaching perigee on May 8 and conjunction on May 9, so that the conditions were favourable to deformation of the earth's crust.

AN International Congress in Naval Architecture and Marine Engineering will be held in London on July 4–8. From a preliminary programme issued by the Institution of Naval Architects we learn that there will be a reception on the evening of July 4, and that the congress will be opened formally on Tuesday, July 5. The mornings of July 6–8 will be devoted to the reading and discussion of papers in the halls of the Institution of Civil Engineers and the Institution of Mechanical Engineers. The programme will include, among others, papers contributed by Admiral Sir Cyprian Bridge, G.C.B., Sir Andrew Noble, Bart., K.C.B., Sir W. H. White, K.C.B., Sir Philip Watts, K.C.B., the Hon. C. A. Parsons, C.B.; *Italy*, Colonel G. Russo; *Japan*, Admiral Kondo, I.J.N., Count Shiba, and Prof. Terano; *Germany*, Dr. O. Schlick and Prof. Flamm; and *France*, Prof. A. Rateau.

THE fifteenth annual congress of the South-eastern Union of Scientific Societies will be held at Guildford on June 8–11 under the presidency of Prof. E. A. Gardner, Yates professor of archæology at University College, London. The presidential address will be delivered on the evening of June 9. There will be a reception by the Mayor on the evening of Wednesday, June 8, followed by the illumination of the Castle grounds, by the Mayor and Corporation, at whose invitation the union will meet at Guildford.

Papers will be read by Mr. Henry Bury, on the relation of the river Wey to the Blackwater and the Arun; Mr. E. A. Martin, on results of dewpond investigation; Mr. J. G. N. Clift, on the Pilgrims' Way between Farnham and Albury; Dr. W. Martin, the interpretation of maps of the sixteenth and seventeenth centuries; Dr. Vaughan Cornish, waves in sand and snow; Mr. J. W. Tutt, colour in insects; Mr. A. R. Horwood, the extinction of cryptogamous plants; and on Saturday evening, June 11 (after the congress), Mr. F. Enock will lecture on aquatic auto-crats and fairies. There will be several excursions and receptions, and a loan museum, which promises to be of exceptional interest. The local secretary is Mr. Frank Lasham, 61 High Street, Guildford, who will send further particulars on inquiry.

IN the issue of the *Archæological and Ethnological Publications of the University of California* for March Mr. T. T. Waterman gives an elaborate account of the ritual of the Diegueño, or, as they call themselves, the Kawakipai, tribe occupying the extreme south of the peninsula. It is remarkable that they have a distinctive cultus of their own, bearing only a slight resemblance to that of their blood-kin the Mohave, or their immediate neighbours the Luiseño. These rites depend little upon their belief in spirit agency. They are based on one or other of two conceptions. The first is that in early infancy, and also at adolescence, persons of both sexes are in a condition of peculiar receptivity, children and young men and women being specially liable to external influences, both good and evil, the former being encouraged, the latter repelled by appropriate ceremonies. The second conception is the belief in the continued existence of the soul after death. Hence their mourning customs depend upon the fear of injury from the spirits of the dead, whom they endeavour to propitiate by various means, such, for instance, as by burning the goods of the dead man so that his property, in an etherealised form, may pass on for his use to the world of spirits.

DR. COMANDON gives details of the application of the kinematograph to the photography of micro-organisms in a paper published in the *Bulletin de la Société d'Encouragement pour l'Industrie nationale* (T. 113, No. 3, p. 318). Dark-ground illumination was adopted with sixteen views per second, the exposure being  $1/32$  of a second. Such objects as trypanosomes and spirilla in blood seem to lend themselves well to the method. It is to be noted that Mr. Duncan in this country several months ago had taken kinematograph views of the circulation of the blood in the frog's web, &c.

THE *Bulletin of the Johns Hopkins Hospital* for March (xxi., No. 228) contains several papers of scientific interest, notably one by Major F. Russell (Medical Corps, U.S. Army) on anti-typhoid vaccination. No untoward results occurred in a series of 3640 vaccinations, and the author believes that the procedure undoubtedly protects to a very great extent against the disease, and is a useful adjunct to other prophylactic measures. In the April number of the *Bulletin* (No. 229) Drs. Marine and Zenhart make the interesting observation of the occurrence of gôitre (active thyroid hyperplasia) in fish. The fish were principally pike and bass of Lake Erie, and it is of interest that, in the same district, human gôitre is prevalent, suggesting that the disease is in some way associated with water, an hypothesis long held in connection with gôitre in man.

THE *Bulletins of the Sleeping Sickness Bureau* for March and April (vol. ii., Nos. 15 and 16) contain the usual useful summary of investigations on trypanosomes, sleeping-sick-

ness news, &c. The latter number contains a translation of an important memoir by Dr. Carlos Chagas on the new human trypanosome discovered in Brazil, and already referred to in *NATURE* (vol. lxxxii., 1909, p. 46). The parasite seems to be conveyed by a species of bug (probably *Conorhinus megistus*, Burm.), the developmental cycle occupying a period of at least eight days. Monkeys and small animals are easily infected. The record of human cases is at present meagre; in fact, laboratory work in this case seems to have outpaced the clinical. The Bureau has also issued a "subject-index" to the "Bibliography of Trypanosomes," with corrigenda, compiled by Mr. C. A. Thimm.

SOME experiments described by Mr. G. T. Atkinson in the last number of the *Journal of the Marine Biological Association* will be of interest to naturalists engaged in fishery research work. In a previous number of the same journal Mr. Atkinson showed that the plaice taken from the recently exploited fishing grounds in the Barentz Sea has a much slower growth-rate than similar fish in the North Sea, and also that the males and females did not become mature until much older than in home waters. In the course of a recent voyage to the Barentz Sea in a Hull steam trawler, Mr. Atkinson brought back a number of living plaice, and marked and liberated these fish in the North Sea in the vicinity of the Dogger Bank. The experiment was highly successful, and in the course of a year about half the plaice had been recaptured. The growth was very rapid when compared with that of normal North Sea plaice, and there was a great improvement in the "condition," this always having been characteristically poor in plaice caught in the Barentz Sea and in Icelandic waters. Such experiments as these point to the possibility of a future rational regulation of the sea-fisheries. Traditional methods of the control of the industry—restriction of fishing gear, fishing apparatus, inspection, and the like—have proved to be rather futile proceedings, and investigations such as that now under notice point to the practicability of the actual cultivation of the truly sea fishes. It is pointed out by Mr. Atkinson that not only plaice, but even the valuable halibut, may possibly be transplanted into the North Sea, and that even such comparatively expensive operations as these are likely to be would be better economy than glutting the market with plaice of such poor quality that they sell for less than one-tenth the price of good North Sea fish, while many have actually had to be used for manure.

AN important contribution to the vexed question of the cytology of yeast is made in a beautifully illustrated paper published in the *Annals of Botany* (January), by Messrs. Wager and Peniston. In general confirmation of the earlier work of Mr. Wager, the authors regard the nuclear apparatus of the cell as consisting of the characteristic vacuole, which is so prominent a feature of this organism, together with a nucleolus, which is a homogeneous spherical or oval body lying outside, but in close contact with, the vacuole, and consisting of a plastin-like substance having very little affinity for nuclear stains. The vacuole contains a clear sap and a nuclear network, and both this and the nucleolus may become more or less impregnated with chromatin. This occurs to the greatest degree during the period of highest fermentative activity, and at the same time the chromatin, previously diffused throughout the cytoplasm, disappears. Other remarkable changes in the nuclear apparatus also accompany the process of fermentation, and it is clear that the nucleus is actively concerned in the phenomenon. In bud formation the nucleolus divides amitotically, and one portion passes into



the daughter-cell, together with a portion of the vacuole and chromatin. In spore formation the vacuole disappears, and the nucleolus then divides, forming two nearly equal portions, between which the granular chromatin is shared, and which again divide. Volutin granules occur in the cytoplasm and vacuole, and glycogen is deposited in vacuoles in the cytoplasm, and appears and disappears with astonishing rapidity under varying conditions of nutrition.

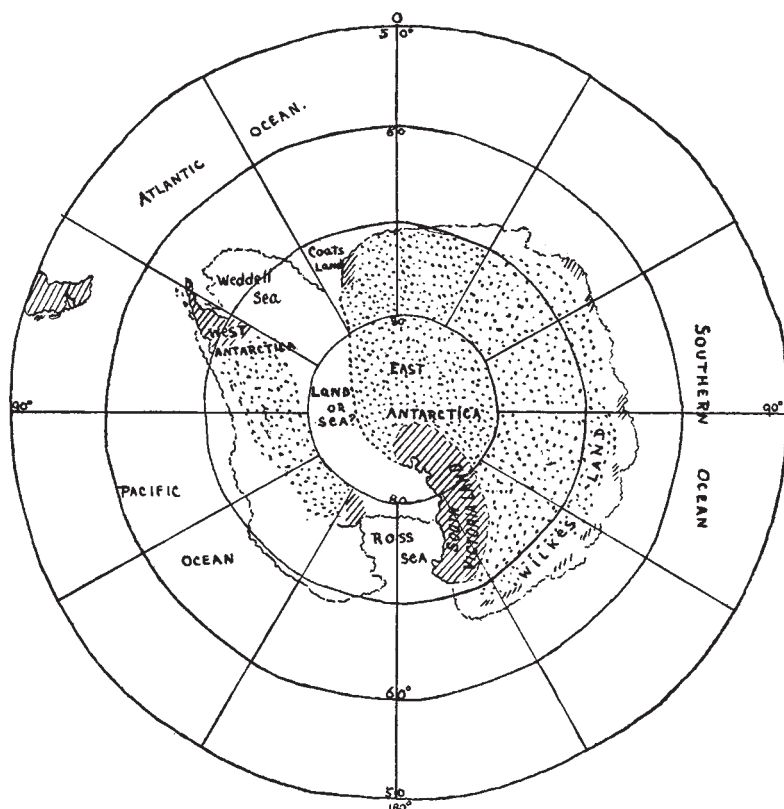
AN account by Mr. F. Pitcher of Victorian vegetation in the Melbourne Botanic Gardens, which appears in the *Victorian Naturalist* (vol. xxvi., No. 11), was prepared with the three-fold object of pointing out a few specimens of trees dating back to pre-settlement days, supplying a list of native plants under cultivation in the garden, and recommending a few of these as suitable for general cultivation. Of the last, the small flowering shrubs, for the greenhouse, are *Bauera rubioides*, *Bossiaea cinerea*, *Grevillea ericifolia*, *Hibbertia stricta*, *Leucopogon virgatus*, and *Tetralthea ciliata*.

AMONG the remarkable instances of plant dispersion cited by the Rev. G. Henslow in a lecture addressed to the fellows of the Royal Horticultural Society, the most striking is that of *Oxalis cernua*. This is a bulbous plant, indigenous to South Africa, that has spread to the Bermudas, Canaries, and Madeira, as well as along the north and south coasts of the Mediterranean. It appears to have been originally introduced to Malta, where it now carpets roadsides, covers old walls, and is generally ubiquitous. The plant in its native habitat is trimorphic, but in Malta and along the Mediterranean only one, the short-styled, form occurs, so that propagation is effected entirely by bulbs, borne on thread-like stems that proceed from the parent plant. In rich soil the stems may also grow above ground, forming runners. Further details will be found in the journal of the society (vol. xxxv., part iii.), where the lecture is published.

THE Bureau of Entomology of the United States Department of Agriculture adopts the very useful plan of issuing bulletins in which full accounts are given of the various insect pests troublesome to farmers, market gardeners, and fruit growers. Mr. Webster describes the lesser clover-leaf weevil (*Phytonomus nigrirostris*, Fab.), a fairly common European insect that appears to have got into the States some forty years ago, but is not yet very widely distributed there. It is, however, capable of doing so much damage if once it is thoroughly established that a careful watch is rightly being kept. A fungus (*Empusa* [*Entomophthora*] *sphaerosperma*) was found to destroy the pupæ. Mr. Phillips deals with the slender seed-corn ground-beetle (*Clivina impressifrons*, Lec.), which attacks recently planted maize seed in swampy, peaty soils. It is a native of the eastern States, and, of the whole genus, is the only species that lives on plants, the others being carnivorous, according to our present knowledge. Dr. Chittenden describes the parsnip-leaf miner (*Acidia fratria*,

Loew.), the parsley-stalk weevil (*Listronotus latiusculus*, Boh.), an insect usually associated with aquatic or semi-aquatic vegetation, but found occasionally on terrestrial plants, and the celery caterpillar (*Papilio polyxenes*, Fab.), which attacks practically all umbelliferous plants—celery, carrot, parsley, parsnip, and so on. The larvæ are very conspicuous, and are readily picked off the plants; moreover, certain ichneumon flies destroy the insect in its pupal stage. Another bulletin, by Mr. Sanders, is devoted to the Euonymus scale (*Chionaspis euonymi*, Comstock), which can be kept in check by kerosene emulsion.

THE current number of the *Zeitschrift* of the Geographical Society of Berlin (1910, No. 3) includes statements as to the aims of the projected German Antarctic Expedition by the leader, Lieut. Filchner, and by Prof. Penck, and a message of goodwill from Prof. Otto Nordenskjöld. The plan of the expedition is based on the hypothesis that the



Sketch-map illustrating the possible connection of the Ross and Weddell Seas.

Ross Sea is directly connected with the south-western part of the Weddell Sea by a narrow belt of sea separating the main area of Antarctica from the land which is assumed to connect Graham Land and King Edward the Seventh Land. This possibility, and also the view that the Antarctic land to the south of the Pacific consists only of an archipelago, must have occurred to all who carefully considered the results collected by the expeditions of Captain Scott and Sir Ernest Shackleton. The meteorological evidence and the apparently well-marked westward trend of the land which drove Sir Ernest Shackleton on to the South Polar plateau seem, however, not very favourable to the idea of the direct connection of the Ross and Weddell Seas. Indications of any such connection might also have been expected from the tidal observations of the *Discovery*.

The evidence, however, is so uncertain that all geographers will hope that Lieut. Filchner will settle the problem by direct observation. Prof. Penck insists that to determine this question is much more important than reaching the Pole. His letter closes with the announcement of a contribution by an anonymous donor of 300,000 marks.

In the monthly meteorological chart of the North Atlantic Ocean for May, issued by the Meteorological Committee, we note with pleasure two advances of considerable importance in maritime meteorology:—(1) Synoptic charts for barometer and wind have been drawn for the Atlantic and adjacent coasts, for 7h. a.m. daily, for current dates, based upon telegraphic reports for north-western Europe, reports by radio-telegraphy from the Atlantic, and information given in the *Paris Bulletin international*. These data cannot fail to be of great use in elucidating the conditions which affect the weather changes of our own region. (2) Charts showing the temperature of the sea surface, also for recent dates, are drawn for the North Atlantic for consecutive periods of seven days, with isotherms for each 10° F. As these means correspond to those given for the land in the *Weekly Weather Report*, they will be available for tracing any connection which may exist between sea temperature and the weather over the British Islands. We also note that the area of the monthly chart relating to the Indian Ocean has been extended from lat. 15° S. to 35° S., thus embracing the region traversed by vessels trading to India, China, &c.

*Cosmos* of April 23 states that Chile has fallen in line with Japan, Italy, Austria, Germany, France, Russia, the U.S.A. and other countries by establishing a Seismological Service. The director is the distinguished seismologist Comte de Montessus de Ballore. Earthquake-observing stations now exist between Tacna and the South Shetlands, that is, along a meridian nearly 3000 miles in length. At five of these heavy Weichert's pendulums have been established, while seismoscopes have been installed at thirty secondary stations. Altogether 550 observers note earthquakes at 430 different localities. During six months 740 different shakings have been recorded. This means that Chile, as an earthquake-producing country, runs neck and neck with Japan. At the central station in Santiago an arrangement of P. Maccioni has been set up. We are told that this instrument responds to electromagnetic waves, and gives warning of approaching earthquakes. This installation is said to be the first of its kind. Other instruments which have been installed, besides those mentioned, are the Bosch-Ömori and Staittesi pendulums. Instruments of the type adopted by the British Association, although they yield more records of undoubted seismic origin than any other type of instrument, do not appear to find a place in the Chilean programme.

A LARGE proportion of the *Electrical Review* for April 29 is devoted to the problem of electrically driving the machinery of cotton and other textile mills. It appears that a considerable number of mills in Lancashire and Yorkshire have recently discarded mechanical in favour of electrical driving, the usual method being to instal a separate motor in each room. There appears to be no doubt that an increase of output has been obtained, but the figures given vary considerably. Two well-illustrated articles deal with the equipment of one of the mills mentioned, and with that of a mill in Germany. In the latter almost every machine is provided with its own motor, so that no shafting is to be seen in the rooms of which views are given.

THE April number of the *Journal de Physique* contains a communication made to the Société française de Physique

in December last by MM. Buisson and Fabry on the application of their interference method of measuring small differences of wave-length to the problems of solar physics. It will be remembered that in their method the light to be investigated is sent through an interferometer consisting of two plane surfaces lightly silvered, and produces a system of light and dark rings, which are focussed on the slit of a grating or prism spectroscope by means of a lens. Each ring produces in the field of view of the spectroscope two points of light the distance apart of which may be determined directly or by measurement of a photograph. When two wave-lengths are to be compared it is only necessary to measure with precision the difference of the distances of these points of light apart. On comparing the iron lines of the solar spectrum with those of the arc in air, the authors find that for some lines the solar is greater, for others less, than the arc wave-length. The solar wave-length is in every case greater, however, than that for the arc *in vacuo*. The authors conclude that if the latter differences are due to the pressure in the reversing layer of the solar atmosphere, that pressure is 5 to 6 atmospheres.

CONTINUING their physico-chemical studies on phosphorus, Messrs. Ernst Cohen and Katsuji Inouye give an account in the current number of the *Zeitschrift für physikalische Chemie* (April 26) of the solubility of ordinary phosphorus in carbon bisulphide, as the previous work on this subject by Giran indicated either the formation of a compound between phosphorus and the solvent or the formation of a new allotropic modification of white phosphorus. The purity of the materials and the method of determining the concentration of the phosphorus in the solutions were carefully controlled, and solubility determinations carried out for nine temperatures between +10° C. and -10° C. The solubility curve found furnished no indication of the compound suggested by Giran, neither was any hitherto unknown allotropic modification of phosphorus obtained.

*Science Progress* for April contains the two first articles, by Dr. H. W. Wiley and Dr. R. Vincent, of a general series dealing with the ethics of food. The question is one of such great national importance, and so much has been talked and written on it of late years, that it is eminently desirable to have serious and unbiased criticism published under authoritative names. Dr. Wiley's legislative crusade in the United States in favour of pure food has made him the centre of a storm of indignation and attack from the threatened interests, but he has maintained his attitude that all considerations other than scientific truth and the public welfare are to be set aside in dealing with the purity of food. No doubt there is much need of a similar crusade in this country, but perhaps the initiative should come from the general public, backed by the manufacturers of repute, rather than from the analytical chemist, as appears at present to be the case. Dr. Vincent's article on milk should be studied by all who have to do with the feeding of children. He makes a very strong point of the fact that recent developments in the milk trade have been distinctly retrogressive, and unhesitatingly condemns the boiling and pasteurising of milk.

A new experimental steam engine has been installed at the Glasgow and West of Scotland Technical College, and was described by Prof. A. L. Mellanby at the meeting of the Institution of Engineers and Shipbuilders in Scotland on April 26. The engine was made by Messrs. Cole, Marchant and Morley, of Bradford, and is of the horizontal, compound, side-by-side type. The high-pressure cylinder is 12 inches, and the low-pressure cylinder

21 inches, in diameter, the stroke being 30 inches. Each cylinder is fitted at each end with separate steam and exhaust valves of the drop-piston type. A steam engine uses considerably more steam than is shown by the indicator to be present in the cylinder at any part of the stroke. This loss has been generally attributed to initial condensation, but more recently the belief has been held that valve leakage is responsible for much of the extra steam used. It is hoped that the trials upon this engine may be used to supplement the work done in other laboratories in elucidating this point. Thus the Armstrong College engine has slide valves; the Manchester Municipal School of Technology engines have permitted of work being done upon Corliss, double-beat drop, and slide valves; the drop-piston valves fitted to the new Glasgow engine should therefore afford opportunities of making useful comparisons.

### OUR ASTRONOMICAL COLUMN.

**COMETARY ORBITS**—Messrs. Crawford and Meyer give new elements for Halley's comet in Bulletin No. 179 of the Lick Observatory, based on observations made on September 17 and December 16, 1909, and February 28, 1910. The perturbations due to Mars in January were found to be ineffective, and the time for perihelion is finally given as April 19-67760 G.M.T.

When it became known that other computers found great difficulty in computing an orbit for comet 1910a, Miss Levy and Mr. Meyer, of the Berkeley Astronomical Department, decided to test a method devised by Prof. Leuschner. For this purpose photographic observations secured by Dr. Curtis, with the Crossley reflector, on February 1, 2, and 5, were selected, and a very satisfactory result obtained from the direct solution for an approximate orbit. Other observations were then considered, covering the period January 18 to March 13, and final parabolic elements calculated by the same method. These are given, with an ephemeris, in Bulletin No. 179, and the ephemeris indicates that the comet is still a little west of the Great Square, and is very faint. Observations by Dr. Aitken on April 13 gave corrections of  $-0.9s.$  and  $-4''$ . Elliptic elements for Daniel's comet, 1909e, published by Sturla Einarsson and R. Young in the same Bulletin, give a period of 6.48 years.

Recently published elliptic elements for comet 1910a give periods of 202.6 and 41 years respectively.

**MEASURES OF DOUBLE STARS**.—No. 175 of the Lick Observatory Bulletin contains the measures of 136 double stars made by Mr. Olivier with the 12-inch and 36-inch refractors of the Lick Observatory. Generally, the stars measured are neglected pairs in the southern hemisphere, such as can be observed from lat.  $38^{\circ}$  N., or pairs which show signs of motion. Eleven new doubles are included, and of the 136 stars observed, 15 are separated by less than  $1''$ , 56 between  $1''$  and  $2''$ , and 30 between  $2''$  and  $3''$ . It is interesting to note that the 12-inch refractor was generally employed, and leaves nothing to be desired as regards definition; a power of either 500 or 625 was always used, and doubles down to  $0.6''$  in distance could be readily measured.

**MAXIMUM OF MIRA, 1909**.—*Astronomische Nachrichten* No. 4403 contains two notes on the most recent maximum of Mira. The first is by Herr May, of the Kasan Observatory, who finds that the maximum took place on September 9, 1909, the magnitude being 3.14. The second is by Herr Landwehr, Münster, and gives September 4.7 and 3.15 respectively. According to Guthnick's ephemeris, the epoch of maximum was September 6.9, and the magnitude should have been 3.27.

**PARALLAX OF THE PLANETARY NEBULA G.C. 4373**.—From a photographic determination, Dr. Bohlin finds that the parallax of the planetary nebula G.C. 4373 (H iv. 37) is  $-0.170'' \pm 0.042''$ , and the correction for the aberration constant is  $-0.043'' \pm 0.042''$  (*Astronomische Nachrichten*, No. 4406, p. 232).

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### HALLEY'S COMET AND METEOROLOGY.

*Proposed Meteorological Observations during Progress through the Tail of Halley's Comet.*

THE International Commission for Scientific Aëronautics had arranged a series of ascents of kites and *ballons-sondes* for May 11-13, but seeing that it is possible that the earth may pass through the tail of Halley's comet on May 19, the members of the commission have agreed to postpone the ascents to May 18-20. A circular from Prof. Hergesell, the president of the commission, gives particulars of the proposed ascents, the times mentioned being as follows:—May 18, 7 a.m. and 10 p.m.; May 19, 2.30 a.m. and 7 a.m.; and May 20, 7 a.m. Observations should be made at the earth's surface, and *ballons-sondes* should be sent up about half an hour before these times, so that the balloon for the principal ascent should reach its greatest height about the time when the earth passes through the tail of the comet; one ascent should also precede, and one should follow, the principal ascent by precisely similar intervals of time.

Messrs. Assmann and Teisserenc de Bort suggest that it might be possible to carry out ascents of manned balloons as well as of *ballons-sondes*, and it is suggested that the aero clubs of different countries should cooperate in the observations. A letter has also been sent out by M. Teisserenc de Bort describing the apparatus he has designed and used for several years for collecting samples of air from great heights. The use of Aitken's dust counter is recommended in connection with the ascents of manned balloons, and similar observations should be made at the earth's surface. Though it is unlikely that the passage of the earth through the tail of a comet will cause any measurable change of temperature in the upper air, yet it is felt by those engaged in the investigation of this subject that such a rare occurrence should not be allowed to pass without some notice.

### Meteors from Halley's Comet.

Mr. Denning writes:—

"During the first week in May the weather was unsettled and stormy, and Halley's comet could not be well observed, nor could its supposed meteoric shower from Aquarius be suitably watched. Several meteors were seen, however, at places where the sky was clear or partially so, and they were directed from the radiant point of the comet, though no brilliant display of these phenomena seems to have been witnessed in England.

"There is a probability of an abundant display of meteors on the morning of May 19, when the earth may encounter the comet's tail, but this is doubtful. The sky should be carefully watched, however, on the morning named with the view of observing any meteors or peculiar auroral effects that may be visible.

"A rich display of meteors is reported to have been witnessed at Cape Town on the morning of May 7 between 2 and 5 a.m. There was no very active shower seen in England on the date mentioned, and further particulars will be awaited with interest.

"A fireball, presumably connected with Halley's comet, was noticed at Guernsey and other places on the morning of May 3 at about 2.50 a.m. As viewed from the Channel Islands, it had a long path ascending from just under  $\beta$  Pegasi to under  $\beta$  Cassiopeiæ, with a duration of four seconds.

"The real path of the meteor was from sixty-seven to forty-six miles in height, and its position over the English Channel from near Dieppe to south-west of the Isle of Wight, and its course, of some 137 miles, was traversed at a velocity of about thirty-four miles per second. This is a slower rate of speed than calculation implies to the Aquarids, but atmospheric resistance evidently moderated the meteor's native velocity. From the south coast of England—especially Sussex and Hampshire—the object must have been a splendidly luminous one, presenting a very long and graceful flight along the southern sky, but I have not hitherto received any observations from this particular part of the country.